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Andrew J. Peltoma

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| EXAMINER |
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VAN, LUAN V

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| ART UNIT | PAPER NUMBER |
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1753

DATE MAILED: 07/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/782,746

Applicant(s)

PELTOMA ET AL.

Examiner

Luan V. Van

Art Unit

1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 December 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 and 9-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7, 9-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

Applicant's amendment of May 25, 2006 does not render the application allowable.

The amendment is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: Claims 1-7 and 9-13 are amended to recite the limitations of "including building up the first conductive material over the spring metal layer to a height of about equal to or greater than the upper surface of the conductive lead layer" and "not reflowing the plated interconnect". However, there is no evidence in the applicant's disclosure to support the amended limitations. First, the disclosure does not support electroplating the first conductive material to a height greater than the upper surface of the conductive lead layer. Second, no explicit mention is made of reflowing; the fact that it is not discussed does not support the claim that such a process cannot be performed. Therefore, the disclosure does not provide a clear indication to support the amended limitations. Applicant is required to cancel the new matter in the reply to this Office Action.

Status of Objections and Rejections

The objection to the claims has been withdrawn in view of Applicant's amendment.

The rejection of claims 8 and 14-17 is obviated by Applicant's cancellation.

All rejections from the previous office action are maintained.

New grounds of rejection under 35 U.S.C. 103(a) are necessitated by the amendments.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-7 and 9-13 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 1-7 and 9-13 are amended to recite the limitations of "including building up the first conductive material over the spring metal layer to a height of about equal to or greater than the upper surface of the conductive lead layer" and "not reflowing the plated interconnect". However, there is no evidence in the applicant's disclosure to support the amended limitations. First, the disclosure does not support electroplating the first conductive material to a height greater than the upper surface of the conductive lead layer. Second, no explicit mention is made of

Art Unit: 1753

reflowing; the fact that it is not discussed does not support the claim that such a process cannot be performed. Therefore, the disclosure does not provide a clear indication to support the amended limitations.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-7 and 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cowles et al. in view of Shangguan et al.

Cowles et al. teach a method for forming an electrical interconnect on an integrated lead suspension of the type having a spring metal layer (stainless steel layer 302, figure 2), a conductive lead layer 306 (figure 2) and an insulating layer 304 (figure 2) separating portions of the spring metal and conductive lead layers, including: forming

Art Unit: 1753

an aperture 300 (figure 2) through at least the insulating layer and the conductive lead layer; and filling the vias with plated solder or screen solder to connect a stainless steel layer to the copper layer (column 3 lines 63-67). The solder is applied through a mask as indicated in figure 2 and removing the mask after solder 308 is formed. Further, Cowles et al. teach that "the same can be done from the stainless steel to the copper layer. Instead of opening the via from copper layer to stainless steel layer, the via is open from the stainless steel layer to the surface of the copper layer through the dielectric layer" (column 2 lines 37-41). Forming an electrical interconnect or an integrated lead suspension or suspension component is an intended use of the instant invention and thus is not given patentability weight.

With respect to the height of the conductive material, Cowles et al. teach the conductive material (i.e., solder 308) is the electroplated over the spring metal layer to a height about equal or greater than the upper surface of the conductive lead layer (see Fig. 2).

With respect to reflowing, Cowles et al. teach the solder is reflowed for increased adhesion to the underlying material (column 4 lines 1-2).

The difference between the reference to Cowles et al. and the instant claims is that the reference uses solder to form the interconnect instead of electroplating a conductive metal on the interconnect (claims 1,7, 9-11); the reference does not explicitly teach further electroplating gold on the interconnect (claims 2-4); or forming a nickel layer (claim 5). In addition, because solder is used, Cowles et al. teach the solder is reflowed for increased adhesion to the underlying material (column 4 lines 1-2).

Shangguan et al. teach a method to form an interconnection between integrated circuit boards and integrated circuits. The method involves metallization of the bond pad and multiple, novel bump compositions and coating compositions to provide an interconnection which is reliable and which withstands differences in the coefficient of thermal expansion between the silicon device in the bump material (Abstract). The metallization is formed by electroplating copper over the interconnect (column 3 lines 51-56). This method is advantageous over conventional solder bumps, because it "is inexpensive, consumes a minimal amount of space, and does not require the use of wire bonding" (column 2 lines 59-63). In addition, Shangguan et al. teach depositing a nickel layer to prevent the diffusion of copper (column 4 lines 15-19), and depositing a gold layer "to provide corrosion protection for the bump during the service of the module" (column 4 lines 59-61).

Addressing claims 1, 6, 7 and 9-11, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Cowles et al. by electroplating a conductive material as taught by Shangguan et al. instead of using solder, because electroplating allows the formation of a high density fine pitch interconnection and is affordable (column 2 lines 44-49 of Shangguan et al.).

Regarding claim 1, since Cowles et al. teach the solder is reflowed for increased adhesion to the underlying material (column 4 lines 1-2), it would have been obvious to one having ordinary skill in the art at the time the invention was made to have omitted the reflowing step if increased adhesion to the underlying material is not required. Moreover, omission of an element and its function is obvious if the function of the

Art Unit: 1753

element is not desired (MPEP 2144.04). In addition, Shangguan et al. teach electroplating a conductive material is advantageous over solder bumps, because it avoids bridging between the bumps during reflow soldering, which limits the density of the device (column 2 lines 33-48 of Shangguan et al.)

Addressing claims 2-4, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Cowles et al. by electroplating a gold film of Shangguan et al., because electroplating a gold film would provide a corrosion barrier for the interconnect.

Addressing claim 5, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Cowles et al. by forming a nickel film of Shangguan et al., because it would provide a diffusion barrier between the underlying conductive substrate and the copper layer.

Regarding claim 6, Cowles et al. differ from the instant claims in that the reference does not explicitly teach that the plated conductive material is not in contact with the conductive lead layer. However, Cowles et al. teach that solder is plated to connect the spring metal layer (i.e., stainless steel layer) to the conductive lead layer (i.e., copper layer). This creates a ground path from the copper layer to the stainless steel layer (column 3 lines 65-67). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Cowles et al. by forming a conductive material which is not in contact with the conductive lead layer if the ground path between the copper layer and the stainless

Art Unit: 1753

steel layer is not desired. By omitting the ground path, the two layers would be electrically isolated from each other.

Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cowles et al. in view of Shangguan et al., and further in view of Gay et al.

Cowles et al. teach the method as described above in addressing claim(s) 1.

The difference between the reference to Cowles et al. and the instant claims is that the reference does not explicitly teach removing oxide from the substrate before electroplating.

Gay et al. teach a method for anodic cleaning of a stainless steel substrate in order to improve to adhesion between the plated layer and the stainless steel (column 1 lines 37-43).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Cowles et al. and Shangguan et al. by removing oxide from the substrate before electroplating as taught by Gay et al., because it would improve to adhesion of the plated layer and the stainless steel.

Response to Arguments

Applicant's arguments have been fully considered but they are not persuasive.

In the arguments presented on page 7 of the amendment, the applicant argues that Cowles et al. teach reflowing the plated solder and thus Cowles et al. would be different from the instant invention. The examiner acknowledges that Cowles et al.

Art Unit: 1753

teach reflowing the plated solder. However, as a first matter, the applicant's amendment limitation of "not reflowing" is deemed to be new matter since no explicit disclosure is made in the applicant's specification that reflowing cannot be performed. Secondly, as the applicant admits on page 8, "plated solder" is generally understood to be a solder that can be deposited either by an electroplating or electroless plating process, which would broadly read on the electroplating process of the instant claim. Furthermore, if a different conductive material other than solder is electrodeposited to form an interconnect, reflowing would not be required. In fact, Shangguan et al. teach electroplating a conductive material is advantageous over solder bumps, because it avoids bridging between the bumps during reflow soldering, which limits the density of the device (column 2 lines 33-48 of Shangguan et al.). According to MPEP 2144.06, substituting the solder of Cowles et al. for another equivalent conductive material of Shangguan et al. for the same purpose, such as forming an interconnect, is prima facie obviousness.

Regarding the argument on page 9 that the solder of Cowles et al. does not extend beyond the polyimide layer, the examiner asserts that this is incorrect. Cowles et al. teach that the solder is formed to a height about equal to or above the copper conductive layer as shown by solder 312 and 308 in Fig. 2.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the

Art Unit: 1753

references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). As the Court of Appeals for the Federal Circuit has stated, there are three possible sources for motivation to combine references in a manner that would render claims obvious. These are: (1) the nature of the problem to be solved; (2) the teaching of the prior art; and (3) the knowledge of persons of ordinary skill in the art. In *re Rouffet*, 47 U.S.P.Q.2d 1,453, 1458 (Fed. Cir. 1998). In this case, Cowles et al. and Shangguan et al. both teach forming an interconnect. The fact that Cowles et al. and Shangguan et al. teach using the interconnect for different applications does not render nonobvious the pertinent teaching of forming an interconnect for an electronic device.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

Art Unit: 1753


extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luan V. Van whose telephone number is 571-272-8521. The examiner can normally be reached on M-F 9:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

LVV
June 28, 2006


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